The Maryland Fruit Grower

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For the past several years the causes and control of scab, blight and peach leaf curl have been ably discussed before the Maryland State Horticultural Society by Extension Service workers from Maryland. These diseases caused heavy losses in Maryland this past season. The following articles are from Virginia workers and apply also to Maryland conditions. Read them carefully.

WHY SO MUCH APPLE SCAB?

S. A. WINGARD,
Plant Pathologist, Virginia Agricultural Experiment Station

Apple scab is caused by a parasitic fungus which is dependent upon the tissues of the apple for its food supply. The fruit, twigs and leaves are attacked and the fungus lives over winter on the old fallen leaves that were infected during the previous season.

The apple scab fungus produces two kinds of spores and these spores compare to seed in higher plants. The spores are produced in great numbers and serve as the infecting agents. The first type of spore is known as the ascospore or winter spore, and is produced in flask-shaped cavities in the old fallen leaves. These spores mature around the middle of April and are then shot up into the air with great force every time it rains. The spores float around in the air like dust particles until they finally settle on the young fruit and leaves where they cause scab infection. It takes about 14 days after infection occurs for the scab lesion to become noticeable. In these lesions we have the summer spores produced in great quantities. From this time on during the season we have the winter spores shooting from below and the summer spores being washed down from above.

It is possible to have ascospore ejections any time during April, May, June and July. Under average conditions, however, the spores are not liberated earlier than the middle of April nor later than the middle of June, a period of 60 days. In general, there are as many as 12 distinct ejections during the season; the minimum number has been 9 and the maximum 16. In the average season, therefore, we must anticipate 12 discharges of ascospores during the 60-day period of rapid development of fruit and foliage; a discharge every 5 days provided the rainfall were evenly distributed in this fashion.

The delayed dormant spray is of minor importance as a scab spray in Virginia. The pink and petal-fall sprays are approximately equal in value for scab control and together they account for about 80 per cent of the total control. They are by far the *most important* scab sprays. The 3-weeks spray is also an important scab spray, valued at 10 per cent, while the 5-weeks spray accounts for 5 per cent of the seasonal control. All other sprays,

including the delayed dormant spray, make up the control percentage not accounted for by the sprays previously mentioned. This amounts to 5 per cent.

We can readily see from the above data that the pink, petal-fall, and 3-weeks sprays are by far the most important for scab control. If for any reason these sprays are not applied at the proper time and in a proper manner, scab will *run wild* if the season is favorable. What happened this season? In many orchards the pink spray could not be applied at the proper time because the buds went through the pink to the full bloom stage before the spray could be applied. Then, on top of this, the rainy weather interfered with the application of the petal-fall and 3-weeks sprays in many orchards. The weather all the time was favorable for scab development. In other cases the growers were trying to keep down cost and, therefore, went too light in the use of fungicides. Some, no doubt, used substitutes for lime-sulphur and the substitutes failed to give control under the very favorable conditions for scab. Either a good sulphur or a copper spray applied, will control apple scab. Copper sprays should not be used for the control of scab except in the late summer sprays. Lime sulphur or some other form of sulphur has to be used in the pink, petal-fall and 3-weeks applications. The substitutes for liquid lime-sulphur are effective during seasons when the weather conditions are not very favorable for scab, but when the weather is wet and cool during April, May and June, growers should not rely upon substitutes. It is not safe to use Bordeaux mixture before the first of June and sometimes this is too early. The temperature should be 85° F. before it is used. Copper will russet the fruit in cool weather.

Studies of the ejection of ascospores from over-wintered leaves have furnished data which clearly explain the major facts of scab control. The rains in May have been found to be the most important factor in scab epidemics in Virginia. The ejection of winter spores is important because these spores cause the first scab infections in the spring. Such infection occurred during the present season and growers had a hard time keeping scab under control.

Sanitary measures, such as the removal, plowing under, or the chemical treatment of fallen leaves, are apparently of little value in scab control. It seems that no matter how scarce the scab infection is the previous season, there is always sufficient spore material to cause an epidemic of scab if the weather is favorable. In the Winchester section scab has been of minor importance since the severe epidemic in 1924, yet scab has developd to an alarming extent in that section during the present season.

It is a well-known fact that apple varieties differ greatly in their susceptibility to scab. However, in years of severe scab infection, some of the so-called resistant varieties may become heavily infected. It is unwise, therefore, in planning a spray program to rely too much on the resistance of varieties as an offset for spraying. The wisdom of this statement has been brought home to us this year. York growers as a rule do not worry much about scab, because the York variety is one of the most resistant to scab. Growers who depended too much on York resistance this year will have a lot a scabby fruit. The average annual losses due to scab, however, are greater in the Piedmont section than in the northern part of the state, due, no doubt, to the heavy plantings of the Winesap variety in the Piedmont section, where-

as the York Imperial variety is widely grown in the Winchester district.

The last severe scab epidemic occurred in 1924. Several factors have played an important part in the control of scab since that time. They are: (1) climatic conditions, there having been several dry seasons; (2) research on the life history of the scab fungus and on the control of the scab disease; (3) better timing of sprays, together with the use of better spray equipment; (4) more thorough and efficient spraying as a result of the use of better equipment; and (5) the use of more effective spray materials. Research at the field laboratories, followed by efficient extension work, has been largely responsible for the successful fight against scab.

The very fact that scab has not been very conspicious during the past few years may have caused some of our fruit growers to let up on control measures and thus let scab get a start. Scab develops most readily during cool, wet seasons. Cool weather in combination with prolonged rainfall and high humidity is ideal for its development. Such conditions prevailed this season.

In conclusion I wish to repeat that experience has shown that no matter how scarce scab infection is the previous season, there are always ascospores in sufficient numbers the following spring to cause a scab epidemic if weather conditions are favorable. For this reason scab is and will always be a disease of great potential importance and the only safe procedure for the fruit grower to follow is to take ample precautions against scab each season. This means that the pink, petal-fall, and 3-weeks sprays must be applied by every fruit grower who wants to make sure of growing a high percentage of No. 1 apples.

(From Extension Division News, August, 1932, Virginia Polytechnic Institute.)

FIRE BLIGHT OF APPLE

By R. C. MOORE
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Blight is caused by bacteria, which enter the flowers or tips of young shoots, multiply, and work their way along the bark tissue, killing the tissue as they advance. It is of an epidemic nature, there being serious outbreaks in some seasons and almost no blight in others, depending upon whether conditions are favorable or unfavorable to its development. Abundant spring and early summer rainfall brings about the vigorous and rapid growth favorable to severe infection.

Varieties differ greatly in susceptibility, York, Grimes and Yellow Transparent being among the most susceptible.

The ease and rapidity with which blight spreads, and the difficulty of controlling it, when once established, make this one of the more serious diseases. In years of heavy infection, yields may be cut down by loss of bloom by blighting. Many shoots may be killed and the tree surface reduced. Cankers may be formed, in which black rot and other rot organisms may become established.

Bacteria, which cause this disease, live over winter in the live tissue around the margins of cankers, ooze out in the spring and are splashed by

rain to blosoms and tips of growing shoots, where they enter and destroy the tissue.

Blossoms are usually the first portions of the tree to show signs of blight in the spring. About the time for fruit to set, clusters with their surrounding leaf tufts become wilted and brown. These later turn black and the deadened blossoms and leaves cling to the spurs. The entire spur may be killed with the formation of a canker at its base.

About the first part of June, shoot growths become wilted and turn brown, giving the appearance of having been seared by fire. Newly blighted shoots are frequently reddish brown at their tips. Later these shoots turn black and die, becoming brittle and hard with their tips inclined to curl. The shriveled, black leaves cling to the blighted shoot for a considerable time.

Cankers are formed under conditions favorable to succulency within the bark. Bacteria spread rapidly down the shoot to a large limb, and sometimes through water sprouts into the trunk. Here they spread out radially to form a cankered circular area, in the center of which is the blighted shoot. This canker first appears as a circular, darkened area, which later becomes sunken and cracks away from the surrounding healthy tissue. A callus is formed around the margin and later the dead bark falls out exposing the bare wood.

Blighted fruit usually becomes infected through its stem attachment to a blighted shoot. The fruit shrivels and turns brown, later becoming a black mummy, which hangs to the twig for a year or more.

Usually only a branch here and there is blighted, but these diseased parts stand out in contrast with the healthy portion of the tree. The characteristic scorched appearance of infected trees and the circular, sunken cankers surrounding a blighted shoot serve to distinguish this disease from others.

Spraying has not been successful in blight control, but the two known methods, if strictly followed, will be effective in holding it in check.

The older method requires that each canker be cut out and the surrounding tissue brushed with a 1 to 1000 strength solution of bichloride of mercury. Blighted shoots should be cut off at least six inches below the blighted tissue, and the tools dipped in the bichloride solution after each cut. Exposed surfaces left by cutting out large limb cankers should be painted with a wound dressing. This cutting should be done some time before bloom. This method is tedious and costly and not likely to be followed by the average workman.

Another method recently developed is effective and does not necessitate cutting out cankers. A solution, which is brushed on the cankers in the spring before growth starts, penetrates the canker tissue and kills the bacteria without damaging the tree to any great extent. Directions for making this solution are as follows:

Add three ounces of concentrated hydrochloric acid to a quart of hot water in an enameled kettle. In this liquid dissolve nine pounds of dry zinc chloride powder, heating if necessary to insure dissolving. Cool this mixture and pour it into seven pints of denatured alcohol, thoroughly mixing. Keep this tightly stoppered until ready for use.

The sooner the canker is detected and treated, the easier the killing and quicker the healing. The entire canker, including the margin must be thoroughly covered. Blighted shoots and spurs may also be treated. About three or four weeks later another inspection should be made, at which time any new cankers may be treated.

Blight has been rather serious the past few years, and, if cankers are allowed to accumulate and seasonal conditions become very favorable to its rapid development, there are likely to be serious subsequent outbreaks in the future just as there have been in the past. Those trees of the susceptible varieties, which receive heavy application of nitrogenous fertilizers, or are located in lower portions of the orchard, are usually most severely blighted.

PEACH LEAF CURL

By S. A. WINGARD,
Plant Pathologist, Virginia Agricultural Experiment Station

Peach leaf curl in the United States causes a loss to the peach industry estimated to be $2,500,000.00 to $3,000,000.00 annually. There is always some leaf curl but due to good dormant spraying in our commercial orchards it has been held under control. Leaf curl, however, is a potential menace and must be guarded against every year.

FACTORS FAVORING INFECTION

In the country at large, leaf curl is more serious near bodies of water where the spring weather is cool and damp. There is correspondingly less of the disease in the drier inland regions.

The season plays such an important part in the occurrence of the disease that the weather has often been held solely responsible for the trouble. Cool, damp weather at the time of infection is necessary for the appearance of the disease in epidemic form. Leaf curl is not serious in seasons when little or no rain occurs as the buds are swelling and the leaves are unfolding. However, it is not safe to delay spraying until the rains come, as the period of infection is short and once the disease has started, no amount of spraying will control it.

SYMPTOMS AND EFFECTS

The first appearance of the disease is noted as the leaves are unfolding. Diseased leaves at this stage are noticeably reddened and become thickened and much curled and distorted as they develop. The green color of the leaf is destroyed very early in the progress of the disease. Any portion or the whole of a leaf may be involved and a part of all of the foliage on the tree may be destroyed depending on the severity of the attack. As the season advances, affected leaves lose their red color and the upper smooth surface becomes gray and powdery from spore production. If cool, moist weather continues, the leaves remain in this condition for some time before they shrivel up and fall from the tree. Dry weather hastens the withering of the diseased leaves. The loss of foliage stimulates the tree to put out a new crop of leaves at the expense of its vitality.

Occasionally twigs are affected by the leaf curl fungus. In severe cases the end of the shoot is enlarged for as much as four or five inches. Most of the leaves on such a shoot are affected. Claims have been made that in succeeding years, leaves produced on diseased twigs would become affected from that source. This is a source of infection that cannot be entirely overlooked.

Trees severely affected by leaf curl seldom hold the set of fruit and fewer fruit buds are formed for the succeeding year. The tree, if well cared

for will recover from an attack of the disease, but one or more crops may be lost, depending on the severity of the attack. Defoliation in successive seasons greatly weakens the three and predisposes it to winter injury. Such trees will produce neither good peaches nor many of them. An occasional epidemic of leaf curl may not permanently injure the orchards, but the loss of a single crop of fruit will more than offset the cost of spraying for several years. Annual spraying where leaf curl is at all prevalent is cheap insurance.

THE CAUSE

Leaf curl is caused by a fungus parasite to which the name *Exoacus deformans* has been given. It, in common with other microscopic plants of its class, reproduces by means of spores. These spores serve the same purpose as seed in the higher plants and carry the parasite over from one season to the next. They are mature at the time the curled leaves take on the light, powdery appearance and are then scattered by the wind to all parts of the tree. Although they are very small and apparently without much in the way of protective coating, the spores find lodgement under bud scales and upraised fragments of bark. There they survive the heat of summer and the cold of the following winter. In the spring as soon as the buds begin to expand, these spores are in a favorable location to grow and cause infections of the young leaves.

As noted above a few leaf infections may come from diseased shoots. Infections from this source, however, are few compared with the total number of infections taking place. Effective protection against infection from the spores will, therefore, satisfactorily control the disease. Control is much simplified because infections take place only as the buds are expanding. Once infection has occurred and the fungus has entered the leaf, the time for control is past.

CONTROL OF LEAF CURL

Leaf curl is one of the simplest diseases to control because of the single spore form, and the short period of infection. Inasmuch as but one application of spray is made, it is more essential that the spraying be thoroughly done. Every bud must be covered and the cracks and crevices must be filled in order to reach all the spores. Experiments and practice have shown that *fall applications* of fungicides are as effective as *spring applications. The period between the falling of the leaves and the onset of freezing weather is especially favorable,* because the soil is firm and the pressure of other work generally not so great as in the spring. If the spraying is delayed until spring, it must be done before the buds begin to swell. Infection takes place soon after the buds begin to expand and then the time for control is gone. Spraying after the disease shows up is time and material wasted so far as the control of leaf curl is concerned. Once the fungus is inside the leaf it cannot be killed unless the leaf is destroyed.

Lime sulfur or Bordeaux mixture will give control of leaf curl. The oil sprays now available will not control leaf curl. Lime sulfur as weak as 1 to 15 will control curl in Virginia. Bordeaux mixture 3-3-50 or copper sulfate, 2 pounds to 50 gallons of solution, will also control curl. The copper sulfate spray or the Bordeaux mixture may be used alone or with oil. Lime sulfur may also be used with oil *if it will mix with the oil.* Use the cold mix oil emulsion with lime sulfur.

In using oil sprays on peaches, it is advisable to wait until all the hard

freezing weather is over but be sure to spray before the buds begin to swell. The temperature should not be below 40° F., and preferably not below 45° F., when the application is made. A good combination to use for the control of both scale and leaf curl is as follows: Oil emulsion sufficient to give an oil content of 3 per cent oil in the diluted spray and Bordeaux mixture 3-3-50. The Bordeaux mixture is made up in the usual way and the oil emulsion is then added to the final diluted solution of Bordeaux.

(From Virginia Fruit, Published by the Virginia State Horticultural Society, June, 1932.)

"ROADSIDE MARKETING"

The automobile has influenced the fruit grower's life in many ways, but perhaps in no way more profoundly than in the matter of the marketing of his products. This is particularly true if he is located on a main highway or near a large center of population. In such a location, he can sell practically all of his produce at his own door. This is an especially attractive feature in these times in that nearly always such sales are cash sales. Also in many instances the containers may be saved for use again. Baskets being used for display purposes can transfer their contents to paper sacks. Such savings are sometimes very considerable. For roadside sales, a much larger number of varieties may be profitably grown than when the product is to be shipped to a general market. Also varieties of high quality but which are not suited for shipment may well be chosen. There should also be a fairly constant succession throughout the normal season of the various fruits. In choosing the varieties to be grown it is well to bear in mind that a very large part of this fruit consumed by the city buyer is bought on the basis of looks. We as individual growers cannot afford to educate these people—but we had better grow and sell them what they want. Newspaper publicity is sometimes necessary in disposing of a large supply of some particular product. A neat sign and an attractive display of the produce can usually be depended upon to move what you have if the prospective buyers come your way. However, no roadside salesman should forget that "the wagging tongue of a satisfied customer" is still the best and cheapest advertising. To merit and profit by this advertising, we must pack only good sound fruit in an honest manner. Experience in the operation of a roadside stand teaches the necessity of displaying a variety of products. Nearly all buyers will purchase more than one item once they have been induced to stop by something in your display. This was illustrated by an incident which happened today. A party driving at a good speed was attracted by some well colored peaches. Before they left they had bought both red and black raspberries as well as peaches. While it is always a good policy for the roadside salesman to hit a happy medium between the wholesale and retail prices for like goods in his nearby market, we have found that there are a large number of people who are willing to pay the full retail price feeling that they are getting value received in that the fruit is freshly harvested and tree ripened. On the other hand, there are those who buy on the basis of price only. They fail to realize that they are asking the producer to give them free the service for which they unhesitatingly pay their corner grocer. The depression has also brought to the fore the

shopper who prices everything and buys nothing. Fortunately, these two pests are not numerous as yet. The operation of a roadside stand implies a lot of hard work and especially long hours. It requires almost constant attention by some member of the family, who can do little else while tending the market. But if conducted with the object of securing the repeat sales, this method of marketing can be made to furnish an outlet for a wide variety of products in a very satisfactory manner.—E. C. Cotton, Elyria, Ohio.

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MAYBE SO

We've heard of the farmer who ran a steam roller over his drought-cooked potato patch and sold the crop as mashed potatoes, and of the fruit grower who exported barrelled apples without refrigeration and sold the "result" as baked and stewed apples, but recently a fertilizer concern hired a circus advertising agent to advertise a new fertilizer. Here's his write-up:

"This new product will do anything imaginable and several things beyond the power of human understanding. A few drops poured on a flower bed will cause flowers to grow so fast that they will get growing pains. It makes century plants bloom twice a day. It grows apples and peaches so large that each fruit must be crated for shipment. One customer sprinkled some of this material on a honeysuckle vine. It took after him and tripped him before he got to the house. It makes garlic grow so fast that it is out of breath before harvest." He lost the job.

* * *

A "smart alec" salesman pulled up beside a potato patch, out in the back country.

"Hey, you," he yelled at the man with a hoe, "I want to go to Brown's store."

The old farmer turned, shifted his "chaw," spat contemptuously, and drawled, "Wall, go on. I ain't a-stoppin' yuh."

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HORTICULTURAL SOCIETY MEETINGS

Peninsula Horticultural Society meets at Camden, Delaware, November 30, December 1 and 2nd.

Virginia State Horticultural Scciety meets at Charlottesville, Virginia, December 6, 7, and 8.

FALL HINTS!

Spray for Peach Leaf Curl.

Examine trees for Mouse injury.

Clean and drain spray machinery.